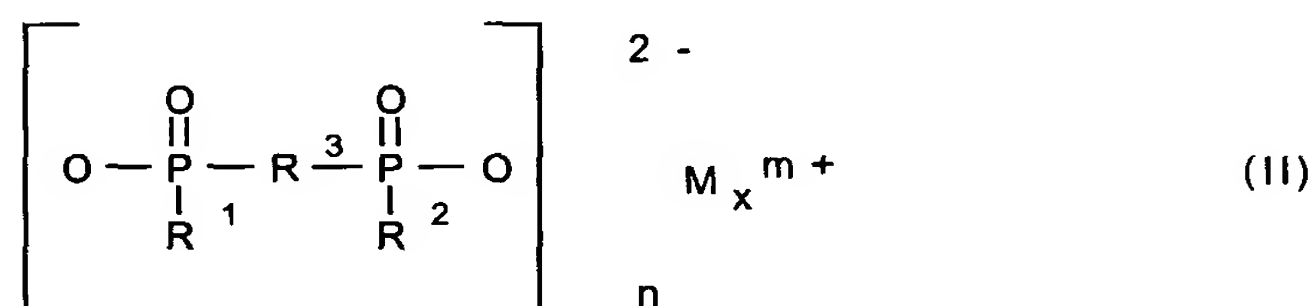
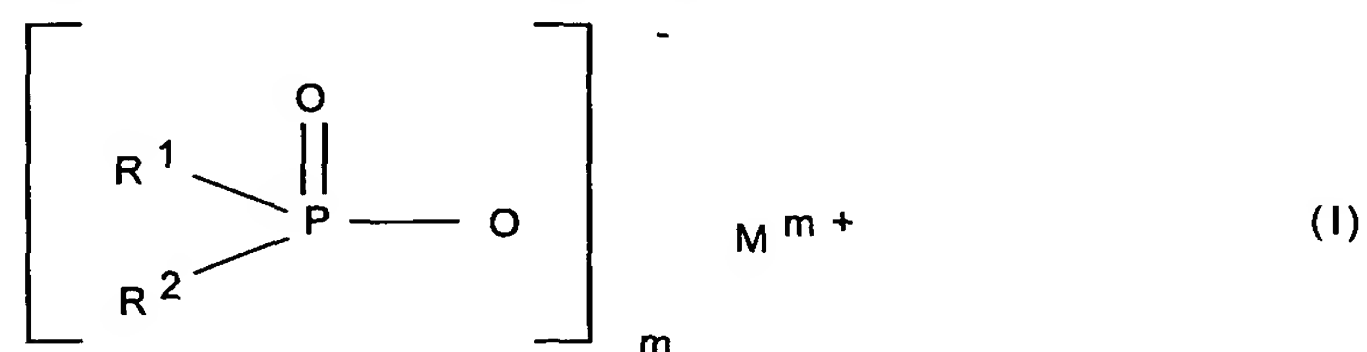


# Patent claims

1. A granular flame-retardant composition composed of an organophosphorus flame-retardant component, and of at least one binder.
2. The granular flame-retardant composition as claimed in claim 1, wherein the organophosphorus flame-retardant component comprises a phosphinic salt of the formula (I) and/or a diphosphinic salt of the formula (II) and/or polymers of these (component A),



where

$\text{R}^1$  and  $\text{R}^2$  are identical or different and are  $\text{C}_1$ - $\text{C}_6$ -alkyl, linear or branched, and/or aryl;

$\text{R}^3$  is  $\text{C}_1$ - $\text{C}_{10}$ -alkylene, linear or branched,  $\text{C}_6$ - $\text{C}_{10}$ -arylene, -alkylarylene, or -arylalkylene;

$\text{M}$  is Mg, Ca, Al, Sb, Sn, Ge, Ti, Zn, Fe, Zr, Ce, Bi, Sr, Mn, Li, Na, K, and/or a protonated nitrogen base;

$m$  is from 1 to 4;

$n$  is from 1 to 4;

$x$  is from 1 to 4.

3. The granular flame-retardant composition as claimed in claim 1 or 2, wherein M is calcium, aluminum or zinc.
4. The granular flame-retardant composition as claimed in one or more of claims 1 to 3, wherein  $R^1$  and  $R^2$  are identical or different and are  $C_1$ - $C_6$ -alkyl, linear or branched, and/or phenyl.
5. The granular flame-retardant composition as claimed in one or more of claims 1 to 4, wherein  $R^1$  and  $R^2$  are identical or different, and are methyl, ethyl, n-propyl, isopropyl, n-butyl, tert-butyl, n-pentyl, and/or phenyl.
6. The granular flame-retardant composition as claimed in one or more of claims 1 to 5, wherein  $R^3$  is methylene, ethylene, n-propylene, isopropylene, n-butylene, tert-butylene, n-pentylene, n-octylene, or n-dodecylene; phenylene or naphthylene; methylphenylene, ethylphenylene, tert-butylphenylene, methylnaphthylene, ethylnaphthylene, or tert-butyl naphthylene; phenylmethlene, phenylethylene, phenylpropylene, or phenylbutylene.
7. The granular flame-retardant composition as claimed in one or more of claims 1 to 6, wherein the composition and/or the organophosphorus flame-retardant component also comprise(s) melamine phosphate, dimelamine phosphate, melamine pyrophosphate, melamine polyphosphates, melam polyphosphates, melem polyphosphates, and/or melon polyphosphates.
8. The granular flame-retardant composition as claimed in one or more of claims 1 to 7, wherein the composition and/or the organophosphorus flame-retardant component also comprise(s) melamine condensation products, such as melam, melem, and/or melon.
9. The granular flame-retardant composition as claimed in one or more of claims 1 to 8, wherein the composition and/or the organophosphorus flame-retardant component also comprise(s) oligomeric esters of tris(hydroxyethyl)

isocyanurate with aromatic polycarboxylic acids, benzoguanamine, tris(hydroxyethyl) isocyanurate, allantoin, glycoluril, melamine, melamine cyanurate, dicyandiamide, and/or guanidine.

10. The granular flame-retardant composition as claimed in one or more of claims 1 to 9, wherein the composition and/or the organophosphorus flame-retardant component comprise(s) nitrogen-containing phosphates of the formulae  $(\text{NH}_4)_y \text{H}_{3-y} \text{PO}_4$  and, respectively,  $(\text{NH}_4 \text{PO}_3)_z$ , where y is from 1 to 3 and z is from 1 to 10 000.

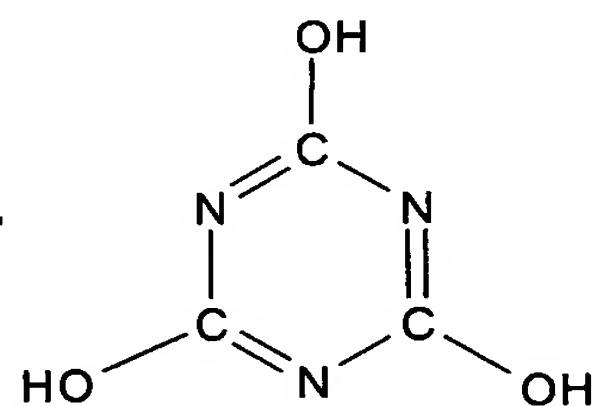
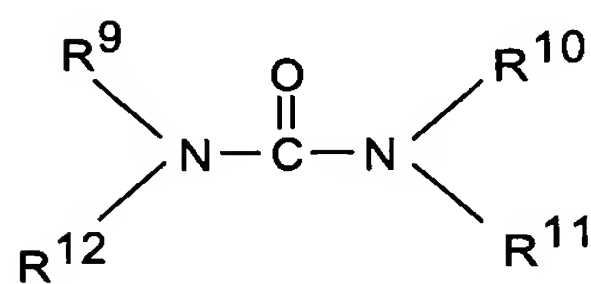
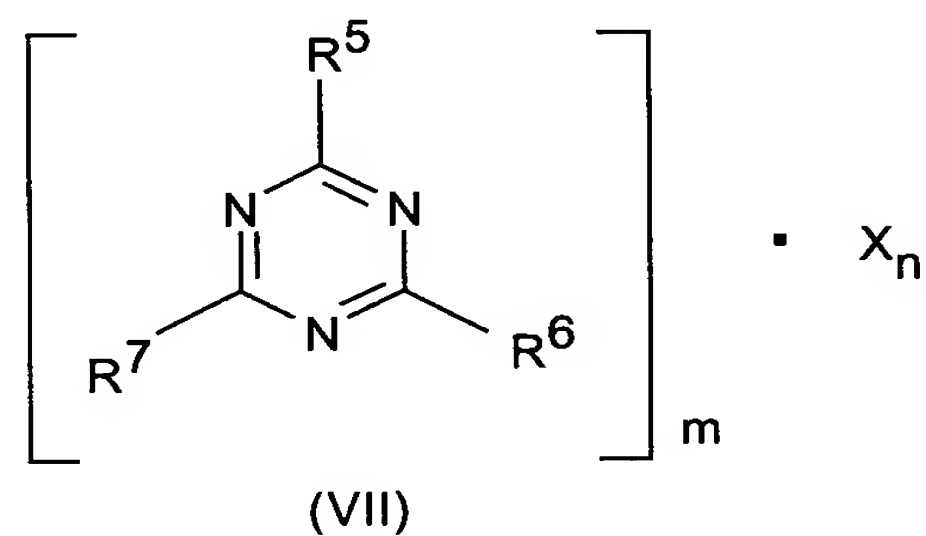
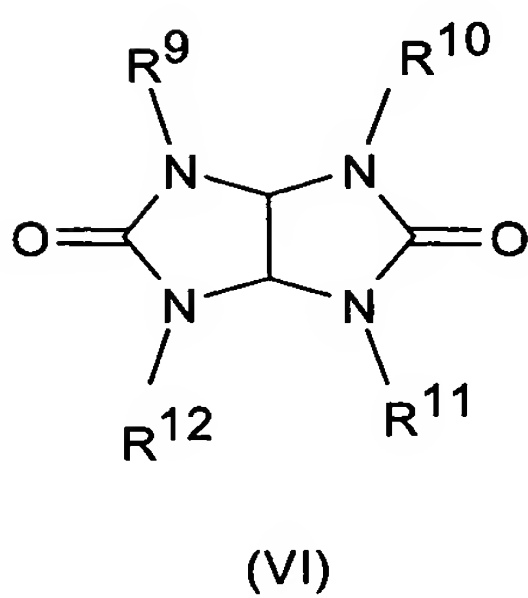
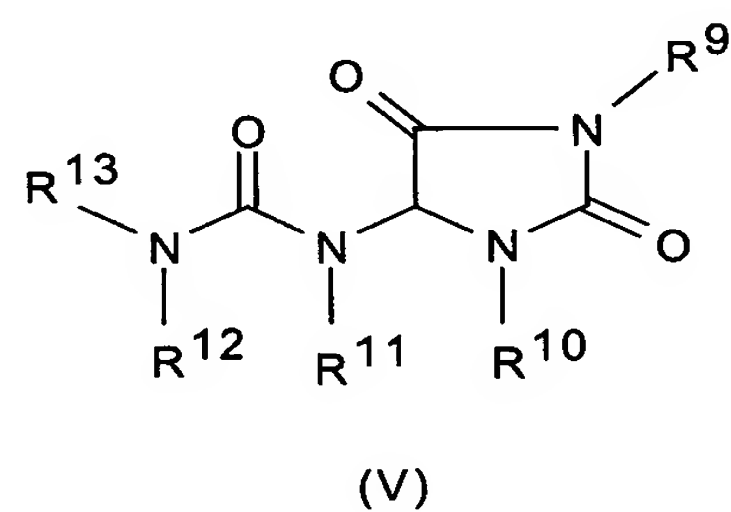
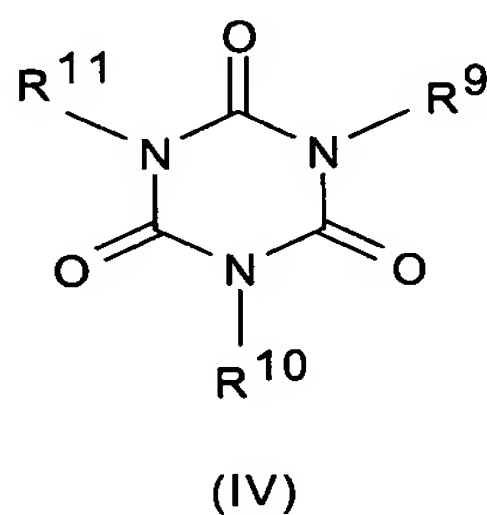
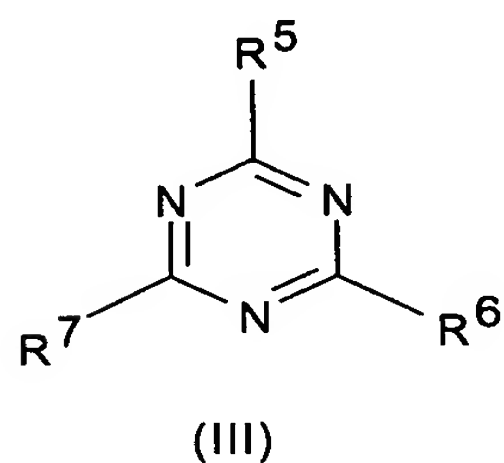
11. The granular flame-retardant composition as claimed in one or more of claims 1 to 9, wherein the composition and/or the organophosphorus flame-retardant component comprise(s), as component B, a synthetic inorganic compound and/or a mineral product.

12. The granular flame-retardant composition as claimed in one or more of claims 1 to 11, wherein component B is an oxygen compound of silicon, is magnesium compounds, is metal carbonates of metals of the second main group of the Periodic Table, is red phosphorus, is zinc compounds, or is aluminum compounds.

13. The granular flame-retardant composition as claimed in one or more of claims 1 to 12, wherein the oxygen compounds of silicon are salts and esters of orthosilicic acid and condensation products thereof, are silicates, zeolites, and silicas, are glass powder, glass/ceramic powder, or ceramic powder; the magnesium compounds are magnesium hydroxide, hydrotalcites, magnesium carbonates, or magnesium calcium carbonates; the zinc compounds are zinc oxide, zinc stannate, zinc hydroxystannate, zinc phosphate, zinc borate, or zinc sulfides; the aluminum compounds are aluminum hydroxide or aluminum phosphate.

14. The granular flame-retardant composition as claimed in one or more of claims 1 to 13, wherein the composition and/or the organophosphorus flame-retardant component comprise(s) nitrogen compounds as further component C.

15. The granular flame-retardant composition as claimed in one or more of claims 1 to 14, wherein the nitrogen compounds are those of the formulae (III) to (VIII) or mixtures thereof



where

- $R^5$  to  $R^7$  are hydrogen,  $C_1$ - $C_8$ -alkyl, or  $C_5$ - $C_{16}$ -cycloalkyl or -alkylcycloalkyl, unsubstituted or substituted with a hydroxy function or with a  $C_1$ - $C_4$ -hydroxyalkyl function, or are  $C_2$ - $C_8$ -alkenyl,  $C_1$ - $C_8$ -alkoxy, -acyl, or -acyloxy, are  $C_6$ - $C_{12}$ -aryl or -arylalkyl, are  $-OR^8$  or  $-N(R^8)R^9$ , or else are N-alicyclic systems or N-aromatic systems,
- $R^8$  is hydrogen,  $C_1$ - $C_8$ -alkyl,  $C_5$ - $C_{16}$ -cycloalkyl or -alkylcycloalkyl, unsubstituted or substituted with a hydroxy function or with a  $C_1$ - $C_4$ -hydroxyalkyl function, or is  $C_2$ - $C_8$ -alkenyl,  $C_1$ - $C_8$ -alkoxy, -acyl, or -acyloxy, or is  $C_6$ - $C_{12}$ -aryl or -arylalkyl,
- $R^9$  to  $R^{13}$  are the groups of  $R^8$ , or else  $-O-R^8$ ,
- m and n, independently of one another, are 1, 2, 3, or 4,
- X is acids which can form adducts with triazine compounds (III).

16. The granular flame-retardant composition as claimed in one or more of claims 1 to 15, wherein the composition and/or the organophosphorus flame-retardant component also comprise(s) carbodiimides.

17. The granular flame-retardant composition as claimed in one or more of claims 1 to 16, wherein the binder comprises alkylalkoxylates having from 8 to 22 carbon atoms and from 1 to 80 EO units per mole of alcohol.

18. The granular flame-retardant composition as claimed in one or more of claims 1 to 16, wherein the binder comprises caprolactam and/or triphenyl phosphate.

19. The granular flame-retardant composition as claimed in one or more of claims 1 to 16, wherein the binder comprises ethylene glycol, propylene glycol and/or butylene glycol, their oligomers and/or polymers, and/or their ethers.

20. The granular flame-retardant composition as claimed in one or more of claims 1 to 16, wherein the binder comprises naturally occurring, chemically modified, and/or synthetic waxes, preferably carnauba waxes and montan waxes.

21. The granular flame-retardant composition as claimed in one or more of claims 1 to 16, wherein the binder comprises synthetic resins, preferably phenolic resins.

22. The granular flame-retardant composition as claimed in one or more of claims 1 to 21, which has a median particle size of from 100 to 10 000  $\mu\text{m}$ , preferably from 200 to 2 000  $\mu\text{m}$ .

23. The granular flame-retardant composition as claimed in one or more of claims 1 to 22, which has an average bulk density of from 200 to 1 500 g/l, preferably from 300 to 800 g/l.

24. The granular flame-retardant composition as claimed in one or more of claims 1 to 23, wherein the ratio of the amount of binder to that of organophosphorus flame-retardant component is from 1:99 to 1:0.11, preferably from 1:49 to 1:0.25, particularly preferably from 1:19 to 1:1.

25. A process for preparing granular flame-retardant compositions as claimed in at least one of claims 1 to 24, which comprises adding, in a suitable mixer, the binder in liquid form to the organophosphorus flame-retardant component, which has been set in motion, and mixing for from 0.01 to 1 hour at from 50 to 300°C.

26. A process for preparing granular flame-retardant compositions as claimed in at least one of claims 1 to 24, which comprises adding, in a suitable mixer, the solid binder to the OPF, which has been set in motion,

mixing at from 50 to 300°C for from 0.01 to 1 hour, and during the process heating to the melting point of the binder.

27. A flame-retardant polymer molding composition which comprises a granular flame-retardant composition as claimed in at least one of claims 1 to 24.

28. The flame-retardant polymer molding composition as claimed in claim 27, which comprises  
from 1 to 50% by weight of granular flame-retardant composition,  
from 1 to 99% by weight of thermoplastic polymer or a mixture of the same  
from 0 to 60% by weight of additives  
from 0 to 60% by weight of filler.

29. The flame-retardant polymer molding composition as claimed in claim 27 or 28, which comprises  
from 5 to 30% by weight of granular flame-retardant composition,  
from 5 to 90% by weight of the thermoplastic polymer or a mixture of the same  
from 5 to 40% by weight of additives  
from 5 to 40% by weight of filler.

30. The flame-retardant polymer molding composition as claimed in one or more of claims 27 to 29, which also comprises components B and/or C.

31. The flame-retardant polymer molding composition as claimed in one or more of claims 27 to 30, wherein the thermoplastic polymers are HI (high-impact) polystyrene, polyphenylene ethers, polyamides, polyesters, polycarbonates, or blends or polyblends of the type represented by ABS (acrylonitrile-butadiene-styrene), or PC/ABS (polycarbonate/acrylonitrile-butadiene-styrene).

32. The flame-retardant polymer molding composition as claimed in one or more of claims 27 to 31, wherein the thermoplastic polymers are polyamide, polyester, or ABS.

33. A polymer molding, a polymer film, a polymer filament, or a polymer fiber, comprising a granular flame-retardant composition as claimed in at least one of claims 1 to 24.

34. A polymer molding, a polymer film, a polymer filament, or a polymer fiber as claimed in claim 33, wherein the polymer is a thermoplastic or thermoset polymer.

35. A polymer molding, a polymer film, a polymer filament, or a polymer fiber as claimed in claim 33 or 34, wherein the thermoplastic polymers are HI (high-impact) polystyrene, polyphenylene ethers, polyamides, polyesters, polycarbonates, or blends or polyblends of the type represented by ABS (acrylonitrile-butadiene-styrene), or PC/ABS (polycarbonate/acrylonitrile-butadiene-styrene), polyamide, polyester, and/or ABS.

36. A polymer molding, a polymer film, a polymer filament, or a polymer fiber as claimed in claim 33 or 34, wherein the thermoset polymers are formaldehyde polymers, epoxy polymers, melamine polymers, or phenolic resin polymers, and/or polyurethanes.

37. A polymer molding, a polymer film, a polymer filament, or a polymer fiber as claimed in one or more of claims 33 to 36, which comprises  
from 1 to 50% by weight of granular flame-retardant composition,  
from 1 to 99% by weight of polymer or a mixture of the same  
from 0 to 60% by weight of additives  
from 0 to 60% by weight of filler.



38. A polymer molding, a polymer film, a polymer filament, or a polymer fiber as claimed in one or more of claims 33 to 37, which comprises  
from 5 to 30% by weight of granular flame-retardant composition,  
from 5 to 90% by weight of polymer or a mixture of the same  
from 5 to 40% by weight of additives  
from 5 to 40% by weight of filler.